Enabling Decentralized Execution in JADC2: Unit Level Intelligence Case Study

By

Capt Christopher Cassidy

Air University Advanced Research

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Virtual In-Residence Squadron Officer School

Maxwell AFB, Alabama

Abstract

As part of the CAF JADC2 AUAR project, this paper examines the need for Joint All-Domain Command and Control systems, specifically the developmental Advanced Battle Management System to consider distributed operations with delegated authorities as a highly likely scenario. It argues that instead of only focusing on the requirements of high-level decision makers and traditional command and control elements, ABMS should be built with unit-level uses in mind. It presents the roles and responsibilities of Air Force unit level intelligence as one use case to illustrate this point for development across the joint force.

Former Chief of Staff of the Air Force General David Goldfein likened the developmental Advanced Battle Management System (ABMS) to the Uber ridesharing app. He described similarities in a common operational picture (COP) that either shows the locations of cars and drivers or "cruise missiles and attack drones," enabling the efficient automatic matching of riders with cars or shooters with targets. In the military context, such a system demonstrated the connection of sensors to battle management to shooters so that the first human interaction was a Navy cruiser commander presented with engagement options for final decision.[1] This depiction is elegant and Gen Goldfein no doubt meant to provide a helpful illustration for mass consumption, but even more technical descriptions of ABMS within Joint All-Domain Command and Control (JADC2) constructs appear to limit themselves to systems that will enable more effective centralized C2. In order confront future highly-contested environments, tools like ABMS must consider integration of an even wider array of users at all echelons. Not to consider from the outset decentralized execution and broad employment of mission command risks an over-reliance on centralized decision making that neglects the force multiplying capabilities of lower-level operators and endangers operational effectiveness when connections to C2 are denied. The roles, capabilities, and recent experience of Air Force unit-level intelligence (ULI) in support of flying operations demonstrate this need to broaden the scope of ABMS in order to achieve resilient JADC2 and effective Joint All-Domain Operations (JADO).

The Department of the Air Force's vision for JADO recognizes that "JADC2 requires greater decentralized execution, a higher degree of delegated authority, and less dependence on central planning and mission direction than recent, low-intensity conflict operations." This is to be enabled by "delegation of conditions-based authorities" for reasons such as degraded communications and significant changes in the operational environment. Delegation allows for mission command through the use of mission-type orders that clearly communicate a higher echelon commander's intent to a lower level commander who exercises the delegated authority.[2] This aligns well with the future distributed operating concepts the Air Force is developing, such as Agile Combat Employment (ACE), that envision units operating without reliable communication to the traditional centralized C2 structure embodied in the air operations center (AOC) and other C2 platforms.[3] When all but the most short-range communications are denied, air expeditionary wing (AEW) commanders or even lower levels at disparate operating locations may have to exercise local C2 with only the most recent higher commander's intent available. This distributed C2 could logically involve capabilities across multiple domains and services that are available within the local/communicable area. This most tactical incarnation of JADC2 will need to be enabled by timely and accurate friendly information and adversary intelligence.

ABMS is intended to provide situational awareness that enables JADC2. It is a system of systems that intends to link sensors with battle management via common applications and a software development kit (SDK) that enables developers to build platforms that communicate information into those applications.[4] The component applications are intended to include data sources, artificial intelligence/machine learning (AI/ML), data fusion, a COP, and ultimately, C2 functions.[5] The approach is encouraging in fusing and evaluating all available sensor data with AI/ML and displaying it to decision makers, but the available documentation indicates the primary customers of the command applications are intended to be "Space, Air, Cyber and All-Domain Command and Control Battle Managers of the future," listing traditional C2 player career fields.[6] These career fields are typically associated with traditional C2 elements like the AOC and tactical C2 platforms, which implies a focus on improving decision making under current models, rather than focusing on building the tools that will enable the most distributed and delegated forms of C2 outlined above. Although ABMS is in its infancy and traditional C2 elements are a logical starting point, it will be essential widen the scope of customers to include the players who will support tactical decision makers, all the way to individual shooters. The functions already performed or anticipated by ULI airmen provide an example of the broader application of ABMS functions that will enable distributed JADC2.

AFTTP 3-3.IPE outlines the ULI structure as a Contingency Intelligence Network (CIN). The CIN consists of: 1. A Combat Intelligence Cell (CIC) that synthesizes internal and external sources to provide all-source analysis in support of wing commanders, mission planners, flying units, and other wing functions such as cyber defense and force protection, in addition to coordinating the wing's intelligence reporting to higher echelons like the AOC; 2. Intelligence personnel integrated into the wing Mission Planning Cell (MPC) to provide tailored threat analysis and targeting data; and 3. Squadron intelligence personnel who provide mission-tailored intelligence briefings to pilots, perform post-mission debriefs, and report debrief-derived intelligence to the CIC.[7] All of these functions, depicted in Figure 1, are essential to the wing's operations, enabling commanders' decisions and arming pilots, defenders, and other wing personnel with threat intelligence, and often, blue operational data, particularly information derived from AOC documents like the air tasking order (ATO). In short, if supplied with the necessary intelligence and operational data and enabled by tools that aid tailored analysis, ULI can enable decision making down to the lowest level, including into the cockpit during mission execution on some platforms.

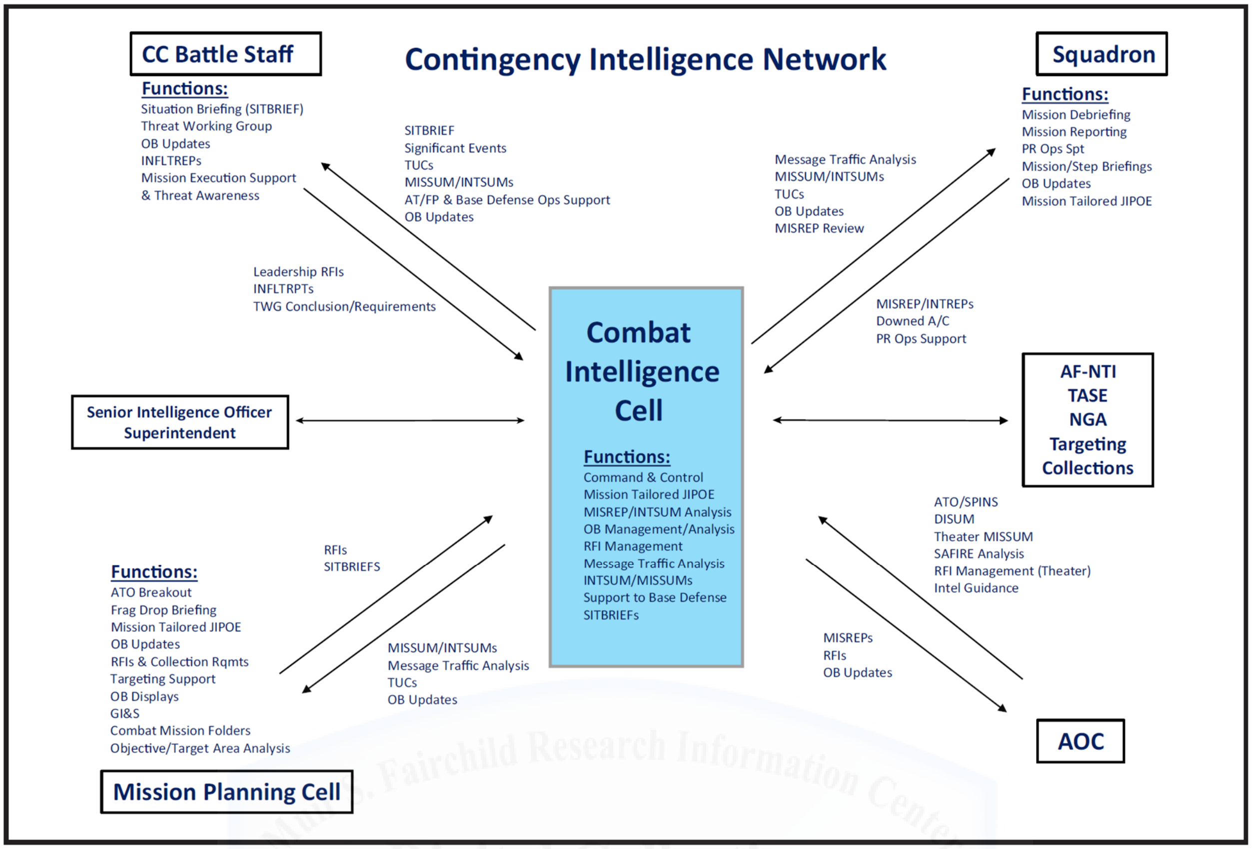

Figure 1 CIN Functions and Relationships[8]

Doctrinally, the AOC's Intelligence Surveillance and Reconnaissance Division (ISRD) is responsible for providing units with a large portion of their required operational intelligence. With the Unit Support cell as an intermediary, the ISRD is supposed to provide updates to Joint Intelligence Preparation of the Operational environment (JIPOE) and assessments of the overall situation through intelligence summaries (INTSUMs), order of battle (OB) updates to track threat locations, mission summaries that conglomerate and assess all units' debrief data about targets struck and threat location and tactics changes, targeting and weaponeering data, and be the primary hub for answering requests for information (RFIs) from the units.[9] In practice, ISRDs are usually not manned sufficiently in numbers or unit-level experience to perform all of these functions in addition to support of the other AOC divisions and ATO production - an already nearly impossible task. ABMS's stated goals of sensor fusion, automatic cuing, and COP generation will automate or aid many ISRD analysis, targeting, and collection management processes, but should not be viewed as a way to simply enable the current hierarchical doctrinal relationship between AOCs and units. Be it due to physical distance, communications issues, or lack of relevant experience necessary to tailor products, AOC unit support personnel will very often be ill-equipped to meet unit needs.

Given the large numbers of support functions required at the unit-level in an increasingly complex operational environment and the expectation that AOC support will not be as complete as doctrine would suggest, ULI airmen frequently rely on manual data processing and analysis. JIPOE tailored to the wing's mission is built in peacetime from research of an array of Intelligence Community (IC) sources. Wartime updates are drawn from any available source, including raw reporting. Lacking sufficient detail or update frequency from the AOC, threat OB that enables mission planning is built from relatively new multi-INT visualization tools like MIST and Thresher, albeit with requirements for analysts to fuse multiple sources to reach a final assessment. Mission data from pilots is still expected to be debriefed and manually input in reporting systems, which currently provide little-to no feedback into the larger multi-INT tools, necessitating ad hoc inclusion in threat location and tactics assessments. The inherit joint nature of air and air defense operations often also requires ULI personnel to understand sister service capabilities, often through experience and relationships, rather than formal processes. These examples only cover more traditional flying support requirements, but demands on ULI airmen can be multiplied for other missions such as force protection and cyberspace defense support.

Consideration of the information needs of tactical-level intelligence personnel, like ULI, and by extension the distributed commanders they support, should be baked into systems like ABMS from the start. Undoubtedly, informing senior decision makers like the Joint Forces

Commander (JFC) and component commanders and their C2 structures is still essential, but JADC2-enabling systems need just as much to anticipate the situations in which authorities are as delegated as previously described and be ready to provide information tailored to lower levels with increased responsibilities. Recent ULI experience and planning for ACE scenarios demonstrates some example functions performed at the unit level that may doctrinally be the responsibility of AOCs or other C2 elements. These include: building operational reconnaissance target decks for organic sensors to answer local information needs, communicating time-sensitive threat or target updates directly to pilots in the air, and performing advanced target development to enable strikes.[10] Understanding the full range of these possible non-doctrinal use cases and including them in ABMS development and other JADC2 concepts will allow capable ULI airmen to support truly distributed operations with, rather than around, tested tools and doctrine. Deliberate development in this area can streamline ULI's many tasks by harnessing the AI/ML-enabled data fusion and display to eliminate manual processing and analysis from disparate sources.

Recognizing the importance of actors like ULI in the development of JADC2 systems highlights some additional requirements to make the systems functional in contested, distributed operations. Anticipating that delegation of authorities may change rapidly in an evolving operational environment, permissions and data displays must be pre-built into different user accesses, ptentially activating automatically if connectivity high higher echelons is lost. Expecting that users will be moving, possibly to unimproved locations, systems should be built to function with little or no connectivity. This would require local storage and continued functionality on local networks until wider connection is restored, then providing a means to synchronize and highlight information that has changed. All of this will require serious, rather than theoretical, discussion about the risk tolerance of senior leaders for decision making at the lowest level, informed by the best data available and qualified analysts.

This situation is not just applicable to distributed air operations. The operational decision-making power that inclusion in system development can bring to the lowest level as decentralized execution within Air Force doctrine also aligns with fundamental concepts for the other services. For example, the Army conception of mission command "empowers subordinate decision making and decentralized execution appropriate to the situation" using mission orders the clearly outline commander's intent.[11] Joint maritime doctrine also highlights the longstanding naval tradition of "mission command involving centralized guidance, collaborative planning, and decentralized control and execution."[12] Therefore, the doctrinal framework exists to delegate authorities across multiple domains, enabled by the support of entities equivalent to ULI, if properly integrated into JADC2 systems. These systems would ultimately enable delegated authorities to exercise C2 across domains, although there is still much work to be done to build knowledge across the joint force for effective all-domain operations.[13]

It would be unwise to assume, even with advanced communications and data processing technologies, that decision making in traditional C2 structures will be effective in contested operations. JADC2 planning and systems development like ABMS must anticipate the implications of truly delegated authorities and the information needs of commanders and operators at the lowest levels. Air Force ULI provides one example of a user set ready to support distributed operations if included in the scope of these new developments.

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[6] Ibid., 18.
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[8] Ibid., A2-8.
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